IS 11467 (1985): Test code for cereal harvesting machines
[FAD 21: Farm Implements and Machinery]

BLANK PAGE

IS : 11467 - 1985
(Reaffirmed 2012)

Indian Standard

TEST CODE FOR CEREAL HARVESTING MACHINES

UDC 631·35 [633·1] : 620·1

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4

October 1986

Indian Standard

TEST CODE FOR CEREAL HARVESTING MACHINES

Harvesting and Threshing Equipment Sectional Committee, AFDC 51

Chairman	*Representing*
DR S. R. VERMA	Punjab Agricultural University, Ludhiana
Members	
DR L. N. SHUKLA (*Alternate* to Dr S. R. Verma)	
SHRI BHUPENDRA	National Agricultural Co-operative Marketing Federation of India Ltd, New Delhi
SHRI B. B. NAYYAR (*Alternate*)	
SHRI CHANDRA MOHAN	Punjab Tractors Limited, Ropar
SHRI G. S. RIHAL (*Alternate*)	
SHRI KARTAR SINGH DEV	Standard Agriculture Engineering Company, Ludhiana
SHRI N. K. DHAND (*Alternate*)	
SHRI N. D. DHIMAN	Vishiv Karma Foundry (Regd), Phillaur
SHRI V. K. DHIMAN (*Alternate*)	
DIRECTOR	Northern Region Farm Machinery Training and Testing Institute (Ministry of Agriculture), Hissar
SENIOR TEST ENGINEER (*Alternate*)	
SHRI R. C. GOEL	Department of Agriculture, Government of Uttar Pradesh, Lucknow
SHRI CHANDRASHEKHAR SHARMA (*Alternate*)	
SHRI J. P. GUPTA	Department of Agriculture, Government of Punjab, Chandigarh
SHRI HARBHAJAN SINGH (*Alternate*)	
SHRI R. K. GUPTA	State Farms Corporation of India Ltd, New Delhi
SHRI M. L. GARG (*Alternate*)	
SHRI J. S. HARA	In Personal capacity (*Village Kanganwal, P.O. Jogiana, Ludhiana*)
SHRI INDERJIT SINGH	Union Forgings, Ludhiana
SHRI PARAMJIT SINGH (*Alternate*)	
SHRI JAGDISH CHANDER	Union Tractor Workshop, New Delhi
SHRI V. P. S. KASHYAP	Department of Agriculture, Government of Haryana, Chandigarh
DR K. N. NAG	Sukhadia University, Udaipur
DR T. P. OJHA	Central Institute of Agricultural Engineering (ICAR), Bhopal
DR R. S. DEVNANI (*Alternate*)	

(*Continued on page* 2)

(*Continued from page* 1)

Members	*Representing*
DR J. S. PANWAR	Indian Agricultural Research Institute (ICAR), New Delhi
SHRI K. K. KAUL (*Alternate*)	
DR K. M. PATEL	Jyoti Limited, Vadodara
SHRI N. C. PATEL (*Alternate*)	
SHRI E. C. PETER	Haryana Agro-Industries Corporation Ltd, Chandigarh
SHRI M. M. KOHLI (*Alternate*)	
SHRI M. R. AHLADA RAO	Vicon Limited, Bangalore
SHRI M. L. KRISHNA MURTHY (*Alternate*)	
SHRI GURMIT SINGH SEHMBEY	Jodhsingh Sehmbey & Sons, Goraya
SHRI SANJEEV KUMAR (*Alternate*)	
DR K. N. SINGH	Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (U.P.)
PROF BHAGWAN SINGH (*Alternate*)	
SHRI V. K. SINGH	ESPI (New Delhi) Trading Company, New Delhi
SHRI R. B. L. SRIVASTAVA	U.P. State Agro-Industrial Corporation Ltd, Lucknow
SHRI S. N. SRIVASTAVA	Department of Agriculture & Co-operation, Ministry of Agriculture
SHRI V. SURAYANARAYANAN	Escorts Limited, Faridabad
SHRI V. K. SINGH (*Alternate*)	
SHRI T. PURNANANDAM, Director (Agri & Food)	Director General, ISI (*Ex-officio Member*)

Secretary

SHRI K. ANBARASU
Assistant Director (Agri & Food), ISI

Indian Standard

TEST CODE FOR CEREAL HARVESTING MACHINES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 July 1985, after the draft finalized by the Harvesting and Threshing Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Harvesting of crops with sickle has been the traditional method in the country. Since the output by this method is low and cost of operation is high, harvesting machines are being developed and used. This test code is being issued in order to evaluate objectively the performance and constructional durability of harvesting machines.

0.3 In the preparation of this standard, assistance has been derived from Central Institute of Agricultural Engineering (ICAR), Bhopal.

0.4 In reporting the result of a test, made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes the method for testing of cereal harvesting machine to evaluate its performance and constructional durability.

NOTE — Harvesting machines include reaper, reaper-binder and windrower.

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in 3.1 of IS : 9826-1981† shall apply.

3. SAMPLING AND GENERAL GUIDELINES

3.1 **Sampling** — For the purpose of commercial test the harvesting machine shall be selected at random (*see* IS : 4905-1968‡) from the production lot

* Rules for rounding off numerical values (*revised*).

† Glossary of terms relating to harvesting and threshing equipment.

‡ Methods for random sampling.

by the testing authority. The machine shall be complete with its usual accessories and in condition generally offered for sale. However in case of proto type and for confidential tests, the machine shall be submitted by the manufacturer.

3.2 Specification Sheet — The applicant shall supply the specification of the machine consisting of the items listed in the specimen report given in Appendix A as well as any further data required to carry out the tests. The manufacturer shall also supply all literature consisting of operational, maintenance, service manual and parts catalogue normally supplied along with the machine.

3.3 Running-In — The machine shall be run-in at the testing station by the applicant in collaboration with the testing station before the start of the test, under his responsibility and in accordance with his usual instructions. If this procedure becomes impracticable for any reasons, the testing station shall run-in the machine provided that the authority of the applicant or his representative, who will remain responsible for running-in, is obtained.

4. TEST

4.0 The tests given below shall be conducted in the laboratory as well as in the field.

4.1 Laboratory Tests

4.1.1 *Specification Checking* — The specifications of the machine given by the applicant (*see* **3.2**) shall be checked and reported in Appendix A by the testing authority.

4.1.2 *Material Analysis* — The hardness and chemical analysis of critical components, such as knife section (*see* IS : 6025-1982*), guard and ledger plate (*see* IS : 6024-1983†) and knife back (*see* IS : 10378-1982‡) shall be made and reported in Appendix B.

4.1.3 *Visual Observations* — The machine shall be subjected to thorough Inspection with particular attention to bearings, drives and other moving parts, correctness of various adjustments, tightness of bolts and nuts, etc. Design of cutting device and operating speed, mechanisms of pick up device and discharging device as well as other adjustable mechanisms. The observations shall be recorded in Appendix C.

4.2 Field Tests

4.2.1 *Field and Crop Conditions and Observations* — The machine shall be operated under the normal field conditions for the crops like wheat and

* Specification for knife sections for harvesting machines (*first revision*).

† Specification for guards for harvesting machines (*first revision*).

‡ Specification for knife back for harvesting machines.

paddy. It may also be used for any other crops as recommended by the manufacturer. It is recommended that the test be carried out at five selected test fields for each crop, the area of each plot being not less than 0·2 ha. For field operation, the machine shall be adjusted in accordance with the manufacturers' recommendations. Following conditions shall be recorded.

4.2.1.1 *Field condition*

a) Shape of the test field;

b) Area of the test field;

c) Topography of the field;

d) Type of the field;

e) Moisture content of soil, percent; and

f) Frequency and size of bunds, if present.

4.2.1.2 *Crop condition*

a) Name of crop;

b) Variety of crop;

c) Appearance, namely, standing, bent, lodged condition and plant inclination angle;

d) Type of weeds present;

e) Extent of weeds, namely, sparse, average and dense;

f) Moisture content of grain, straw and weeds;

g) Straw-grain ratio;

h) Maturity of crop (age at the time of harvesting);

j) Number of tillers/m^2;

k) Total bio mass/m^2 for crop and weed; and

m) Number of grain/earhead (average of 10 observations)

4.2.1.3 *Machine condition*

a) Adjustments of working parts of machine;

b) Travel pattern of machine; and

c) Operating speed.

4.2.2 *Determination of Pre-Harvest Loss* — The pre-harvest losses shall be determined, at three places randomly selected within the area selected, for test run. The area from where the sample is to be collected shall preferably be 1 m in direction of travel and full or half width of cutter bar of the machine depending upon its size. All the loose grains, complete and

incomplete earheads fallen in the marked area shall be picked up manually without undue vibrating the plants and analysed for determining the pre-harvest losses in kg/ha. The wire rectangles of appropriate size may be used for marking the area.

4.2.3 *Field Operation and Collection of Data* — The machine shall be operated for at least 10 minutes before recording the data. The machine shall be adjusted as per manufacturer's recommendations. The machine should be operated at a uniform speed and in such a manner as to use its full cutting width. As far as possible, a constant stubble height shall be maintained. In each field the test shall be carried out at the same forward speed as used in the preliminary adjustment. No change in the forward speed adjusted before the test and any stoppage during the test run shall be permitted. If this happens because of some unavoidable circumstances the test observations shall be repeated.

4.2.3.1 During and after the operation, the following observations and data shall be recorded:

a) Cutting width;

b) Cutting height with range of adjustment;

c) Applicable inclined angle of plant;

d) Percentage of crop not harvested (cutter bar loss-uncut plants/m^2 area);

e) Slippage and sinking of machine;

f) Condition of windrow or bunches or bundles on the ground;

g) Grain losses (operation, collection loss, handling, cutter bar loss, and conveyor loss);

h) Operational (travelling) speed;

j) Time spent for turning at headland;

k) Actual operating hours;

m) Time spent for adjustment of machine;

n) Time spent for machine handling; and

p) Fuel consumption/hour.

4.2.3.2 Following additional observations shall also be made and recorded:

a) *Ease of operation and handling* — Observations shall be made on skill and intensity of effort required to operate various controls of the machine. Adequacy of accessibility of controls shall also be recorded. The note on operator's working condition, the ease of setting adjustment, routine maintenance and other similar features shall also be made.

b) *Safety provisions* — The note on any safety devices provided in the machine shall be taken.

c) *Soundness of construction* — Observations shall be made of those features which adversely effect the operation and efficiency of machine in the field. All the breakdowns and defects occurring during the course of field evaluation period shall be recorded.

d) *Labour requirement and cost of operation* — Number of workers and man-hour required for harvesting one hectare as well as cost of operation may also be recorded. The cost of operation may be calculated on the basis of IS : 9164-1979*.

4.2.3.3 The observations shall be recorded in Appendix D.

APPENDIX A

(*Clauses* 3.2 *and* 4.1.1)

PROFORMA FOR SPECIFICATION SHEET OF THE HARVESTING MACHINE

1. GENERAL

1.1 Name and Address of the Manufacturer

1.2 Name and Address of the Applicant

1.3 Country of Origin (In case of Imported Model)

1.4 Model

1.5 Serial No.

2. TYPE AND SIZE OF PRIME MOVER

2.1 Engine

2.2 Power Tiller

2.3 Tractor

3. TYPE OF MACHINE

4. CUTTER BAR ASSEMBLY

4.1 Effective Cutting Bar Width

4.2 Working Width

*Guide for estimating cost of farm machinery operation.

4.3 Guard Spacing

4.4 Knife Stroke (Amplitude)

4.5 Stroke per Minute

4.6 Arrangement and Range of Adjusting Cutting Heights

4.7 Type of Ledger Plates

4.8 Type of Knife Blade

4.9 Details of Knife Drive

4.10 Type of Dividers

4.11 Arrangement for Lifting Lodged Crop

4.12 Knife Drive Safety Arrangement

4.13 Type of Crop Conveyance

a) **Auger type**

Details: Speeds
Method of change of speed
Details of centre fingers
i) Number
ii) Range of in and out throw
iii) Arrangement for adjustment

b) **Canvas conveyor**

Details : Width
Type
Linear speed
Method of tensioning
Type of battens and their disposition

4.14 Arrangement for Tilting of Cutter Bar Platform

4.15 Type of Under Shot Conveyor

a) Canvas type
b) Chain and comb type.

4.15.1 *Details of Canvas Conveyor*

a) Width
b) Type

c) Linear speed
d) Method of tensioning
e) Type of battens and their disposition.

4.15.2 *Chain and Comb Type*
a) Type and No. of chain
b) Type and size of combs
c) Linear speed
d) Arrangement of tensioning
e) Arrangement for clearance
f) Adjustment between comb and platform.

4.16 Height of Cutter Bar Assembly in Transport Position

4.17 Arrangement of Locking Cutter Bar Assembly in Transport Position

4.18 Type of Suspension of the Cutter Bar Assembly

5. PICK UP AND GATHERING DEVICES

5.1 Type

5.2 Type and Number of Tine Bars

5.3 Diameter

5.4 Range of Speed

5.4.1 *Arrangement for Changing the Speed*

5.5 Maximum Distance Ahead of Cutter Bar Points

5.6 Maximum Distance Behind the Cutter Bar Points

5.7 Maximum Vertical Distance Below Cutter Bar*

5.8 Maximum Vertical Distance Above Cutter Bar*

5.9 Distance from Cutter Bar to Front of Feed Auger Drum

5.10 Arrangement for Raising and Lowering the Reel Assembly

5.11 Arrangement for Foreword and Backward Movement of the Reel Assembly

5.12 Arrangement for Variation of Angle of Tine Bar

5.13 Type of Reel Drive

*Measured in maximum forward position of cutting table.

SIDE DELIVERY AND DISCHARGING DEVICES

7. WHEELS

7.1 Number

7.2 Size

7.3 Pressure

7.4 Track

8. TYPE OF DRIVE FOR VARIOUS UNITS

9. DETAILS OF CONTROLS WITH THEIR LOCATION

10. SAFETY DEVICES

11. OVERALL DIMENSIONS

11.1 Width

11.2 Length

11.3 Height

12. GROUND CLEARANCE

13. TOTAL MASS

14. ATTACHMENTS AVAILABLE

14.1 Standard

14.2 Optional

15. RECOMMENDED CROP CONDITIONS

15.1 Types of Crops

15.2 Planting Pattern — (Row to row spacing and plant to plant spacing)

15.3 State and Condition of Crop to be Harvested—

a) Moisture content of grain, *Min/Max*

b) Moisture content of straw, *Min/Max*

15.4 Applicable Plant Height

15.5 Applicable Inclined Angle of Plant

16. RECOMMENDED TRAVELLING SPEED

17. WORKING CAPACITY OF THE MACHINE — (ha/h).

18. ANY OTHER DETAIL

NOTE—Delete the item which is not applicable to a particular type of the machine and add any other desirable characteristics.

APPENDIX B

(*Clause* 4.1.2)

DATA SHEET FOR MATERIAL OF CONSTRUCTION

SL NO.	COMPONENT	MATERIAL	HARDNESS
(1)	(2)	(3)	(4)
i)	Knife section		
ii)	Knife back		
iii)	Ledger plate		
iv)	Guard		
v)	Others		

NOTE—Chemical composition of components shall also be indicated.

Testing Engineer

APPENDIX C

(*Clause* 4.1.3)

DATA SHEET FOR VISUAL OBSERVATIONS AND ADJUSTMENTS

C-1. OBSERVATIONS

a) Adequacy of protection of bearings against the ingress of dust;
b) Adequacy of safety arrangements, specially at moving points;
c) Provision for lubrication of moving parts;
d) Provision for easy changing of components requiring frequent replacement;
e) Welding of seams;
f) Tightness of bolts and nuts and other fasteners; and
g) Provisions for belt tightening.

C-2. ADJUSTMENT

a) Marker adjustment;
b) Forward speed;
c) Guide for side crop;
d) Ground clearance; and
e) Wheel track.

C-3. DETAILS OF DIFFERENT MECHANISMS

a) Cutting mechanism;
b) Pick-up device;
c) Gathering device;
d) Ejection device; and
e) Side delivery device.

Testing Engineer

APPENDIX D

(*Clause* 4.2.3.3)

DATA SHEET FOR FIELD TESTS

D-1. FIELD CONDITION

a) Location;
b) Size of field:
   i) Length
   ii) Width
c) Topography;
d) Type of soil;
e) Moisture content;
f) Frequency and size of bunds;
g) Penetrometer reading (where ground conditions are soft); and
h) Bunds in the field (height and interval).

D-2. CROP CONDITION

a) Name of crop;
b) Variety of crop;
c) Appearance;
   i) Standing
   ii) Bent
   iii) Lodged condition, and
   iv) Plant inclination angle.
d) Type of weeds present;
e) Extent of weeds, sparse, adverse and dense;
f) Total length of straw, including ears, from ground level;
g) Moisture content of grain, straw and weed;
h) Straw-grain ratio;
j) Maturity of crop (age at the time of harvest);
k) Number of tillers/m^2;
m) Total bio mass/m^2 for crop and weed; and
n) Number and mass of grain/earhead

D-3. ATMOSPHERIC CONDITIONS

a) Temperature, °C;
b) Pressure, kPa;
c) Relative humidity, percent; and
d) Wind velocity, m/s.

D-4. MACHINE ADJUSTMENTS

D-5. PRE-HARVEST LOSS

D-6. TEST DATA

a) Date of test;
b) Total duration of test, h;
c) Total time of stoppage, h;
d) Total idle running, h;
e) Total operational time, h;

f) Width of cut, m;
g) Area Covered, ha/ha;
h) Average speed, m/s;
j) Average height of cut, cm;
k) Loss, percent (on the basis of total yield, kg/ha);
m) Total and hourly fuel consumption;
n) Total engine oil consumed;
p) Tyre sinkage (in case of paddy harvesting); and
q) Turning space required, m.

D-7. OBSERVATIONS

a) Presence of any marked vibration during operation;
b) Presence of undue knocking or rattling sound;
c) Frequent slippage of belts;
d) Smooth running of shafts in their respective bearing;
e) Frequent clogging of cutting and delivery units;
f) Any marked wear, deformation and breakdown;
g) Frequent loosening of fasteners;
h) Any loss of grain ahead of cutter bar;
j) Evenness of cutting of crop; and
k) Adequacy of safety provisions.

D-8. LABOUR REQUIREMENT AND COST OF OPERATION

a) Actual number of persons required before test for preparation of test;
b) Number of labour required for operation;
c) Cost of operation/h;
d) Cost of operation/ha; and
e) Cost of operation/tonne of grain/or crop.

Testing Engineer